

STEM Society Meeting, July 11, 2017

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Last Edit: 8/25/2017

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1 About the STEM Society and the STEM Society Website

STEM is an abbreviation for Science, Technology, Engineering and Mathematics. The acronym STEM is commonly associated with K-12 education, but our use of the term is only slightly bound to this meaning. There are over one hundred people on the mailing list, although a much smaller group attends any one meeting. We meet on the second Tuesday of each month at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The meetings are open to all. The start time is 6PM. We make presentations, have discussions, and have demonstration experiments. These relate to Science,

the History of Science, Mathematics, Engineering, Philosophy and Technology at all levels. The topics have ranged from a technical discussion of the Mathematics of General Relativity to scientific experiments for young students.

These meeting notes contain links to many other documents, which may be viewed or downloaded by clicking the link. A partial list of documents can be reached by clicking the heading **Documents**. The meeting notes may also be viewed in an archive file (archive.pdf), which is in the list of documents. Many of the documents are PDF files. They may be viewed or downloaded to the computer by clicking, provided Adobe Reader, or another program capable of reading PDF files, is present. There are many more documents available at the site than are listed under **Documents** because the documents.htm file is not at all up to date. The last time I checked, about March 2014, there were about 350 document files on the site. We are in the process of creating better techniques for finding documents and authors. The first meeting of the STEM Society was in November of 2006.

The web site is:

<http://www.stem2.org/>

Direct to the documents list:

<http://www.stem2.org/je/documents.htm>

Direct to the archive file:

<http://www.stem2.org/je/archive.pdf>

2 The July 11, 2017 Meeting Announcement

The July meeting of the STEM Society will take place on the second Tuesday of the month, July 11, 2017, at the Trailside Center at 99th and Holmes in Kansas City, Missouri. The starting time is 6PM. Also look at our website for past meeting notes:

The web site is:

<http://www.stem2.org/>

Possible Topics and Discussions:

(a) Perhaps this month we can concentrate on the neglected topic of technology. I have been reading a book titled "Big Bang" by Simon Singh. Somewhere in the book Singh quotes Ernest Rutherford, "There are two kinds of science, physics, and stamp collecting." Lately I have been doing a bit of "stamp collecting" myself, collecting machine screws and making collections of types of screw threads. I have been mining these mainly in my basement, a prodigious source, and perhaps some might think this a good way to waste a lot of time. But perhaps it is not such a waste. I propose to talk about my beautiful burgeoning collection and shall bring it to our amazing meeting. I can talk about the history of screws, about making them with a lathe, and about more efficient means of production such as rolling.

I would like to talk about involute gears and the transmission of uniform rotational motion. Several years back I wrote computer programs to generate such gears and to prove some of their terrific properties. Unfortunately much of this work was done on sophisticated engineering workstations running UNIX, including Apollo, Hewlett Packard. and Silicon Graphics machines, and which I no longer have access to. I wrote a nice report on this work, but unfortunately the interesting figures for the report seem to have been lost. Also I constructed nice animations, but of course no longer have access to any machines to run them.

When I was about 9 years old I was a world class expert on the famous New Departure coaster bicycle brake, a most ingenious mechanism, and thus was able to disassemble, clean, grease, and reassemble the brake blindfolded. No mean feat, which gave me tremendous influence over the other kids in my neighborhood. I certainly would like to demonstrate this again, but alas no longer have access to this great invention of the late nineteenth or early twentieth century. But there are some videos about it on the internet I think.

Also perhaps we can cut some threads, and show how wooden screws were chased to build Gutenberg presses, giving us the pleasure of books and their knowledge.

Screw threads and gears are beautiful objects much more interesting than the crown jewels imprisoned in the tower, with the likes of the wives of Henry the eighth.

Electronics is another topic we have neglected lately. Perhaps I can talk about the difference between linear power supplies and the efficient switching power supplies present in PC's.

Bring in your technology!

(b) I might present a review of the new book by Dava Sobel, "The Glass Universe" about how the women of the Harvard observatory made great contributions to human knowledge.

(c) Sometime back I was asked to talk about the Wronskian and its use in the theory of differential equations, which I shall likely do this month.

(d) Others no doubt shall talk about other interesting subjects and adventures. And Bob Williams perhaps shall have some fine new jokes.

3 Gear Hobbing

A Gear Hobbing machine is a type of a milling machine that produces gears by revolving a cutter called a gear hob that rotates while the gear blank rotates against it as if it were a mating gear. A rather ingenious device.

A small gear hobbing machine

SMALL GEAR HOBBER - YouTube

https://www.youtube.com/watch?v=ZpJ0Ej-kX_o

Creating a gear hob and a worm drive

<https://www.youtube.com/watch?v=-umcQtrn1CQ>

4 The New Departure Model D Bicycle Brake and It's Mysteries

See the sketch of the brake which I extracted from my youthful memory:

to be supplied

See pictures of the New Departure brake and its parts:

stem2.org/je/newdepbrake.jpg

stem2.org/je/ndparts.jpg

sheldonbrown.com/coaster-brakes/new-departure.html

4.1 How the Brake Works

When the pedals are moved forward the chain moves the sprocket on the rear wheel clockwise. The left end of the sprocket is a coarse screw which is screwed into a part functioning as a nut, and which is screwed to the right toward the sprocket, when viewed from the rear of the bicycle, and locks the sprocket and chain to the tapered hub. This is because this nut has a slight cone shape that fits the tapered hub. Thus pedaling forward propels the bicycle.

When the pedals rotate backwards the nut moves to the left squeezing a stack of discs together. This stack contains alternating discs, one type of disk is connected to a shaft with two flats on it. The shaft is prevented from turning with an arm joined to the frame of the bicycle, so the discs of this type are stationary with respect to the bicycle frame. On the other hand the second type of disk has tabs that fit into groves in the hub so that they rotate with the wheel. When the stack of discs are squeezed together the friction between the two types of discs causes the hub, and so the wheel to slow or stop. When the peddles are neither pedaled forward not backward, the bicycle coasts. However there is a problem with the brake as described. When the bicycle is moving the nut could be rotating with the hub, or fixed to the frame when the brake is applied. But in order for the sprocked screw to move the nut left or right, it must not be rotating with the sprocket with the sprocket to be switched between it's two functions. So there is a clip that fits around the left end of the nut with a tab that fits into the part that applies pressure when the brake is engaged, but which allows the nut to turn when it is locked into the hub. That is when the bicycle is pedaled forward the nut is rotated, but when it is not locked to the hub it should be not rotating relative to the frame. This is done with friction with the tabbed clip.

5 Dave VanDyne: Wood Carving, Spoons, The Shaving Horse, Gouges, Chisels, Hatchets, Drills, and Trees

Dave expostulated, instructed, demonstrated, and topped it all off by letting us smell the beautiful wood of his spoons, and then presented everyone with one of these beautiful carved creations, these smooth objects of art, and sacrilegiously suggested that we might allow these noble beings to be dipped into some common soup or salad, or even perhaps into some big nasty mouth.